

THE UNIONE FAUNA OF THE GREAT LAKES.

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The Unione fauna of the Great Lakes is one of considerable interest to the student of geographic distribution. It might naturally be expected that the St. Lawrence system, extending from Minnesota to the ocean, and affording a continuous waterway of more than 2,000 miles, and which flows nearly east and west through a region of substantially the same climatic and other environmental conditions, and with no natural connections with the Mississippi and Ohio systems, would be inhabited by a common fauna, throughout its entire length. As compared with the Mississippi drainage system, which extends from the far north to the almost semi-tropical regions of the Gulf States, it would seem that the fauna of the latter would naturally be much more diverse in its character than that of the St. Lawrence system, but the contrary is the case. The fauna of the Mississippi Valley, from one end to the other, is a substantially homogeneous fauna, varying simply in the number of species in different parts of its extent. But on examining the Unionidæ of the Great Lakes, we find that, while the fauna of Lake Superior, at the western extremity of the system is similar to that of the lower St. Lawrence, and the New England States, there is in the center of the system, with Lake Erie as its metropolis, an entirely different fauna, which extends eastward as far as the Ottawa River and Montreal, and westward to the Saginaw Valley, and even perhaps as far as Mackinac. The relations of this fauna are entirely with that of the Ohio and Mississippi Valleys.

This interpolation of a distinct faunal area in the middle of a great drainage system is very remarkable, and, so far as I know, is without parallel in any other of the great river systems of the world. And when, in addition to this, we find that there this intermediate fauna is, in almost every case, so modified from the typical form of the several species represented, that, in a very large proportion of the species, the Great Lake forms have, at one time or another, been described as species distinct from the typical forms as found in the Mississippi fauna, and that this fact has recently been made the basis of an argument by Dr. Scharff, in his interesting book on the "Distribution and Origin of Life in America," for his theory of

an unglaciated area in central North America, on the ground that this peculiar fauna of Lake Erie and the adjoining waters is a relict fauna, the remnant of a pre-glacial immigration from the south, rather than a post-glacial invasion, which has been modified since the disappearance of the glacier, the subject becomes one of considerable importance and worthy of careful consideration.

The study of the geographic distribution of the North American Naiades is one of comparatively recent origin, and it is only within the last fifteen or twenty years that any particular attention has been given to it. The fact is that it is only within that time that sufficient data have been accumulated, upon which any reasonable generalizations could be based. The time and efforts of the earlier generation of students, of which Dr. Lea was the leading exponent, were wholly taken up in differentiating and describing the new species as they were collected in various parts of the country. The first attempt to deal in any general way with the distribution of the fauna was that of Simpson, who, in his monumental work, "The Synopsis of the Naiades," published in 1900, not only put the classification of the family for the first time upon a scientific basis, but also separated the fauna into its several main constituents.

According to Simpson, North America, north of Mexico, is divided into three great faunal areas: on the east and limited on the west by the Appalachian Mountains toward the south, and extending in an indefinite direction towards the north and northwest, is the Atlantic region; on the west coast, bounded by the Rocky Mountains and the Sierra Nevadas on the east, is the Pacific region; while the whole interior portion of the country, extending from the Gulf as far north as *Unione* life can survive, forms one large province inhabited by the fauna, which he calls the Mississippian. The additional information of the subject that has been accumulated since the publication of Simpson's book has served only to confirm the correctness of his general division into these three great regions, but, as might be naturally expected, certain modifications will have to be made as the results of our increased knowledge of the range of many of the species. So far as the purposes of this paper are concerned, it is only necessary to say that, in figure 1, p. 20, I have extended the Atlantic region across the Georgian Bay and about half way along the eastern end of Lake Superior, both on the north and on the south shores.

FIG. 1.



While it is, perhaps, probable that the whole of Lake Superior should be included in this system, I have hesitated to do so on account of the apparent failure of *Unio complanatus*, which may be considered the characteristic species of the fauna, to extend into the western part of the lake. It is quite possible that it may, but we have no definite record of its occurrence west of Marquette county, Michigan, on the south shore, or of the Michipicoten River, on the north shore. It was not found by the University of Michigan expeditions of 1904 and 1905, either in the streams of Ontonagon county,

Michigan, on the south shore, nor at Isle Royale, at the western end of the lake. On the other hand, *Lampsilis luteola*, a characteristic species of the Mississippian fauna, was common at Isle Royale, and is known to extend along the south shore as far at least as Marquette county, and is represented on the north shore by a closely allied form, *Lampsilis superioriensis*, from the Michipicoten River.

The fauna of the Atlantic region, in its northern portion, is a very meagre one. As represented in the New England States, and in a general way as far south as Mason and Dixon's Line, it consists of only thirteen species, but south of that, and increasingly so towards the extreme south, it becomes a wonderfully varied fauna, in which the specific lines in many of the groups seem to be almost wholly obliterated. As an example of this, it might be mentioned that, in the case of *Unio complanatus* Dill., while Dr. Lea, in the northern portion of the region, recognized only the one species, in the southern portion he described no less than forty-six forms as distinct species, which Simpson in his synopsis has referred to the typical form as synonyms.

Taking the Atlantic fauna as represented in New England as the basis of comparison with that of the Great Lakes, as found in Lake Erie and the Detroit River, we find the two faunas represented by the following list :

LAKE ERIE.

NEW ENGLAND.

*Truncilla**triquetra triangularis* Bar.*sulcata delicata* Simpson.*perplexa rangiana* Lea.*Micromya fabalis* Lea.*Lampsilis**ventricosa canadensis* Lea.*multiradiata* Lea.*luteola rosacea* DeKay.*recta sageri* Con.*nasuta* Say.*iris* Lea.*parva* Bar.*alata* Say.*Lampsilis**cariosa* Say.*ochracea* Say.*radiata* Gmel.*nasuta* Say.

- gracilis* Bar.
leptodon Raf.
Obovaria
leibii Lea.
ellipsis Lea.
Plagiola
elegans Lea.
donaciformis Lea.
Obliquaria reflexa Raf.
Strophitus edentulus Say. *Strophitus undulatus* Say.
Anodonta *Anodonta*
marginata Say. *marginata* Say.
imbecilis Say.
grandis footiana Lea. *cataracta* Say.
 implicata Say.
grandis benedictensis Lea.
Anodontoides ferussaciana sub-
cylindracea Lea.
Symphynota
compressa Lea.
costata Raf.
Alasmidonta *Alasmidonta*
 undulata Say.
marginata varicosa Lam. *marginata varicosa* Lam.
calceolus Lea. *heterodon* Lea.
Hemilastena ambigua Say.
 Margaritana margaritifera L.
Unio gibbosus Bar. *Unio complanatus* Dill.
Quadrula
hippopæa Lea (*plicata* Say ?).
lachrymosa Lea.
pustulosa Lea.
rubiginosa Lea.
undata Bar. (?).
coccinea paupercula Simp.
subrotunda Lea.
tuberculata Raf.

The Atlantic fauna is made up of five genera and thirteen species,

while the Lake Erie fauna includes fifteen genera and thirty-nine species.

Of the Atlantic fauna, three species, *Lampsilis nasuta*, *Anodonta marginata* and *Alasmidonta marginata varicosa*, and perhaps a fourth,¹ are also found in Lake Erie.

Two species, *Margaritana margaritifera*, a preglacial immigrant from Europe, and *Alasmidonta undulata*, do not extend into the Erie basin and have no closely allied representatives there.

The remainder, though not found in the Lake Erie fauna, are, nevertheless, represented there by closely allied species evidently of a common derivation, as indicated in the foregoing list. Eliminating these species, we find the remainder of the Lake Erie fauna to consist of eleven genera and thirty species, which are not represented in any way in the New England fauna.

The relation of these two faunas in the region of the Great Lakes region can, perhaps, be best shown graphically by a comparison of the range of two of their characteristic species, which are closely related to each other, and both of wide distribution, viz., *Unio complanatus* Dill, and *U. gibbosus* Bar.

It will be observed from figure 2, that *Unio complanatus* extends from the Atlantic region proper, northwesterly across Ontario into Georgian Bay, up the St. Mary's River and along the eastern half of both the north and south shores of Lake Superior, and, so far as we know, probably occupies all of the Canadian region north and east of that line as far as Hudson's Bay and Labrador. On the other hand, *Unio gibbosus*, the representative of the Mississippian fauna, extends from the Menominee River, the dividing line between Wisconsin and Michigan, entirely around the shore of Lake Michigan and along the south shore of Lake Huron from Mackinac through the St. Clair River, Lake St. Clair, the south shore of Lake Erie, and east as far as the Ottawa River. At that point the two species are found living together in the same stream. It occupies, of course, the entire inland region south of the Great Lakes in Wisconsin, Illinois, Michigan, Ohio and western New York.

¹ The specific distinctness of *Strophitus edentulus* and *undulatus* is questioned by eminent authority.